

## **QSFP-40G-AOC90M-FT-OPC**

Fortinet® Compatible TAA 40GBase-AOC QSFP+ to QSFP+ Active Optical Cable (850nm, MMF, 90m)

### **Features**

- Support up to 4x10 Gbps bi-directional operation
- SFF-8436 QSFP+ compliant
- Compliant to the IEEE802.3ba
- Automatic power down while broken cable is detected to improve eye safety
- Reliable VCSEL and PIN photonic devices
- I2C standard management interface
- Excellent high speed signal integrity
- Low power consumption
- Operating Case Temperature 0 to 70 Celsius
- RoHS Compliant and Lead-Free



### **Applications:**

- 10G/40GBase Ethernet
- Proprietary high speed, high density data
- High performance computing, server and data storage

### **Product Description**

This is an Fortinet® compatible 40GBase-AOC QSFP+ to QSFP+ active optical cable that operates over active fiber with a maximum reach of 90m. At a wavelength of 850nm, it has been programmed, uniquely serialized, and data-traffic and application tested to ensure it is 100% compliant and functional. This active optical cable is TAA (Trade Agreements Act) compliant, and is built to comply with MSA (Multi-Source Agreement) standards. We stand behind the quality of our products and proudly offer a limited lifetime warranty.

### Absolute Maximum Ratings

| Parameter                  | Symbol           | Min. | Typ.   | Max. | Unit |
|----------------------------|------------------|------|--------|------|------|
| Supply Voltage             | V <sub>CC</sub>  | -0.5 |        | 3.6  | V    |
| Storage Temperature        | T <sub>stg</sub> | -40  |        | 85   | °C   |
| Operating Case Temperature | T <sub>c</sub>   | 0    | 25     | 70   | °C   |
| Relative Humidity          | RH               | 5    |        | 85   | %    |
| Data Rate Per Channel      |                  |      | 4*10.3 |      | Gbps |

### Electrical Specifications

| Parameter           | Symbol            | Min.  | Typ. | Max.  | Unit | Notes |
|---------------------|-------------------|-------|------|-------|------|-------|
| Supply Voltage      | V <sub>CC</sub>   | 3.135 | 3.3  | 3.465 | V    |       |
| Supply Current      | I <sub>CC</sub>   |       |      | 400   | mA   |       |
| Power Dissipation   | P <sub>DISS</sub> |       |      | 1500  | mW   |       |
| Clock Rate - I2C    |                   |       |      | 400   | KHz  | 1     |
| Module Turn-On Time |                   |       |      | 2000  | ms   | 2     |

#### Notes:

1. For the management interface.
2. Time from module power-on/insertion/ResetL de-assert to module fully functional.

## Optical Characteristics

| Parameter                                     | Symbol  | Min. | Typ.   | Max. | Unit | Notes |
|-----------------------------------------------|---------|------|--------|------|------|-------|
| <b>Transmitter</b>                            |         |      |        |      |      |       |
| Reference Differential Input                  | Zd      |      | 100    |      | Ω    | 1     |
| Optical Return Loss Tolerance                 |         |      |        | 12   | dB   |       |
| Differential Data Input Swing                 | VIN,pp  | 180  |        | 1200 | mV   |       |
| Differential Data Input Threshold             |         |      | 50     |      | mV   | 2     |
| <b>Receiver</b>                               |         |      |        |      |      |       |
| Reference Differential Input Impedance        | Zd      |      | 100    |      | Ω    | 1     |
| Differential Data Output Swing                | VOUT,pp | 0    |        | 800  | mV   |       |
| Pre-Emphasis Pulse Amplitude Percentage       |         | 0    |        |      | %    | 4     |
|                                               |         | 10   |        |      | %    |       |
|                                               |         | 20   |        |      | %    |       |
|                                               |         | 40   |        |      | %    |       |
| Pre-Emphasis Pulse Duration                   |         |      | 30     |      | ps   |       |
| Signal Speed                                  |         |      | 4*10.3 |      | Gbps |       |
| Differential Data Output Swing                |         | 150  |        | 850  | mV   |       |
| Differential Data Output Swing When Squelched |         |      |        | 50   | mV   |       |
| Rise/Fall Time (20-80%)                       |         | 24   |        |      | ps   |       |

### Notes:

1. AC coupled inside the AOC module.
2. Input swing to trigger Tx-squelch.
3. User selectable. Percentage is the ratio of pre-emphasis amplitude to output swing. Users could change by writing to page 3 address 237, default value is "10."

## Pin Descriptions

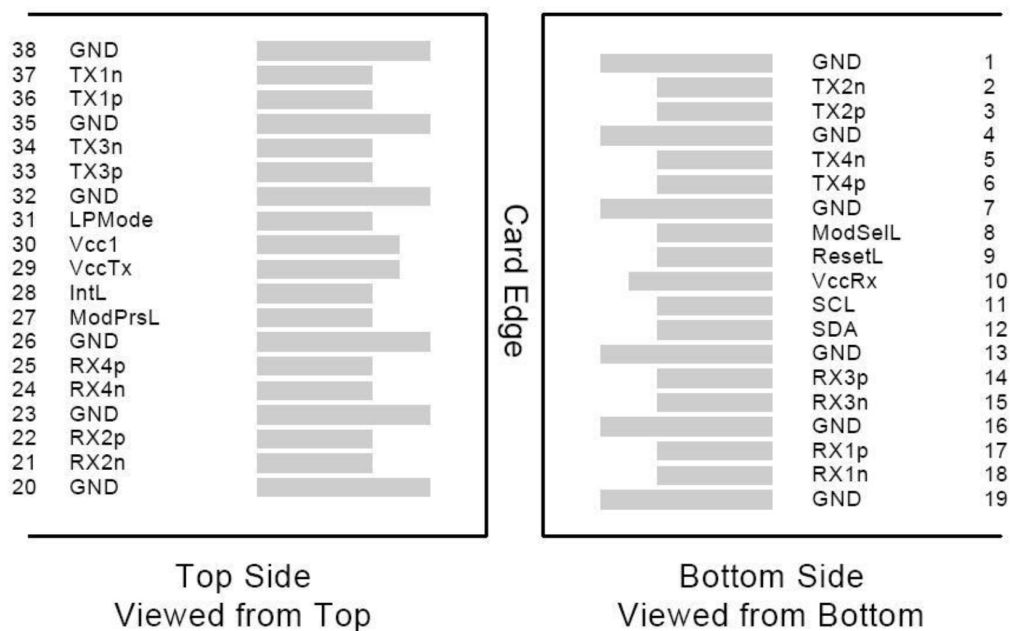
| Pin | Logic       | Symbol  | Name/Description                                        | Note |
|-----|-------------|---------|---------------------------------------------------------|------|
| 1   |             | GND     | Module Ground.                                          | 1    |
| 2   | CML-I       | Tx2-    | Transmitter Inverted Data Input.                        |      |
| 3   | CML-I       | Tx2+    | Transmitter Non-Inverted Data Input.                    |      |
| 4   |             | GND     | Module Ground.                                          | 1    |
| 5   | CML-I       | Tx4-    | Transmitter Inverted Data Input.                        |      |
| 6   | CML-I       | Tx4+    | Transmitter Non-Inverted Data Input.                    |      |
| 7   |             | GND     | Module Ground.                                          | 1    |
| 8   | LVTTL-I     | ModSelL | Module Select.                                          | 2    |
| 9   | LVTTL-I     | ResetL  | Module Reset.                                           | 2    |
| 10  |             | VccRx   | +3.3V Receiver Power Supply.                            |      |
| 11  | LVC MOS-I/O | SCL     | 2-Wire Serial Interface Clock.                          | 2    |
| 12  | LVC MOS-I/O | SDA     | 2-Wire Serial Interface Data.                           | 2    |
| 13  |             | GND     | Module Ground.                                          | 1    |
| 14  | CML-O       | Rx3+    | Receiver Non-Inverted Data Output.                      |      |
| 15  | CML-O       | Rx3-    | Receiver Inverted Data Output.                          |      |
| 16  |             | GND     | Module Ground.                                          | 1    |
| 17  | CML-O       | Rx1+    | Receiver Non-Inverted Data Output.                      |      |
| 18  | CML-O       | Rx1-    | Receiver Inverted Data Output.                          |      |
| 19  |             | GND     | Module Ground.                                          | 1    |
| 20  |             | GND     | Module Ground.                                          | 1    |
| 21  | CML-O       | Rx2-    | Receiver Inverted Data Output.                          |      |
| 22  | CML-O       | Rx2+    | Receiver Non-Inverted Data Output.                      |      |
| 23  |             | GND     | Module Ground.                                          | 1    |
| 24  | CML-O       | Rx4-    | Receiver Inverted Data Output.                          |      |
| 25  | CML-O       | Rx4+    | Receiver Non-Inverted Data Output.                      |      |
| 26  |             | GND     | Module Ground.                                          | 1    |
| 27  | LVTTL-O     | ModPrsL | Module Present. Internally pulled down to the GND.      |      |
| 28  | LVTTL-O     | IntL    | Interrupt output should be pulled up on the host board. | 2    |
| 29  |             | VccTx   | +3.3V Transmitter Power Supply.                         |      |
| 30  |             | Vcc1    | +3.3V Power Supply.                                     |      |
| 31  | LVTTL-I     | LPMode  | Low-Power Mode.                                         | 2    |
| 32  |             | GND     | Module Ground.                                          | 1    |
| 33  | CML-I       | Tx3+    | Transmitter Non-Inverted Data Input.                    |      |
| 34  | CML-I       | Tx3-    | Transmitter Inverted Data Input.                        |      |
| 35  |             | GND     | Module Ground.                                          | 1    |
| 36  | CML-I       | Tx1+    | Transmitter Non-Inverted Data Input.                    |      |
| 37  | CML-I       | Tx1-    | Transmitter Inverted Data Input.                        |      |

### Notes:

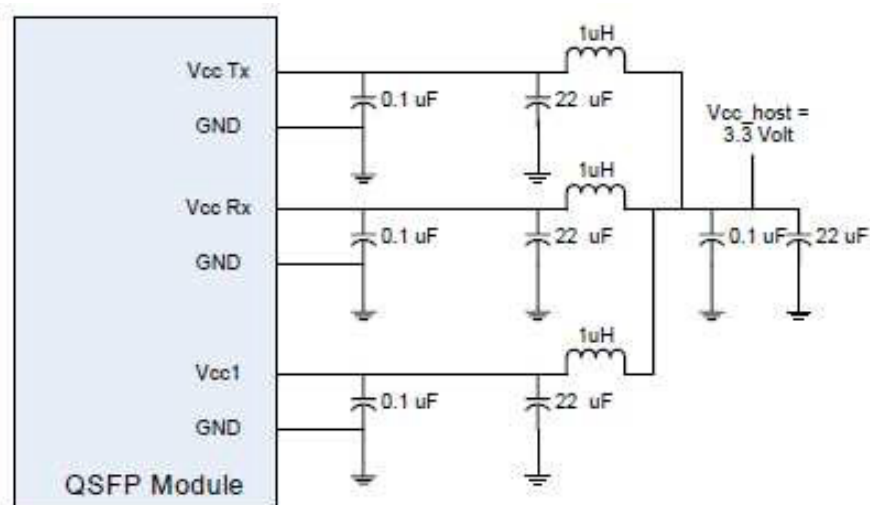
1. GND is the symbol for signal and supply (power). Connect these directly to the host board signal common ground plane.

2. VccRx, Vcc1, and VccTx are the receiving and transmission power suppliers and shall be applied concurrently. VccRx, Vcc1, and VccTx may be internally connected within the QSFP+. The connector pins are each rated for a maximum current of 500mA.

## Pin Assignment and Pin Description

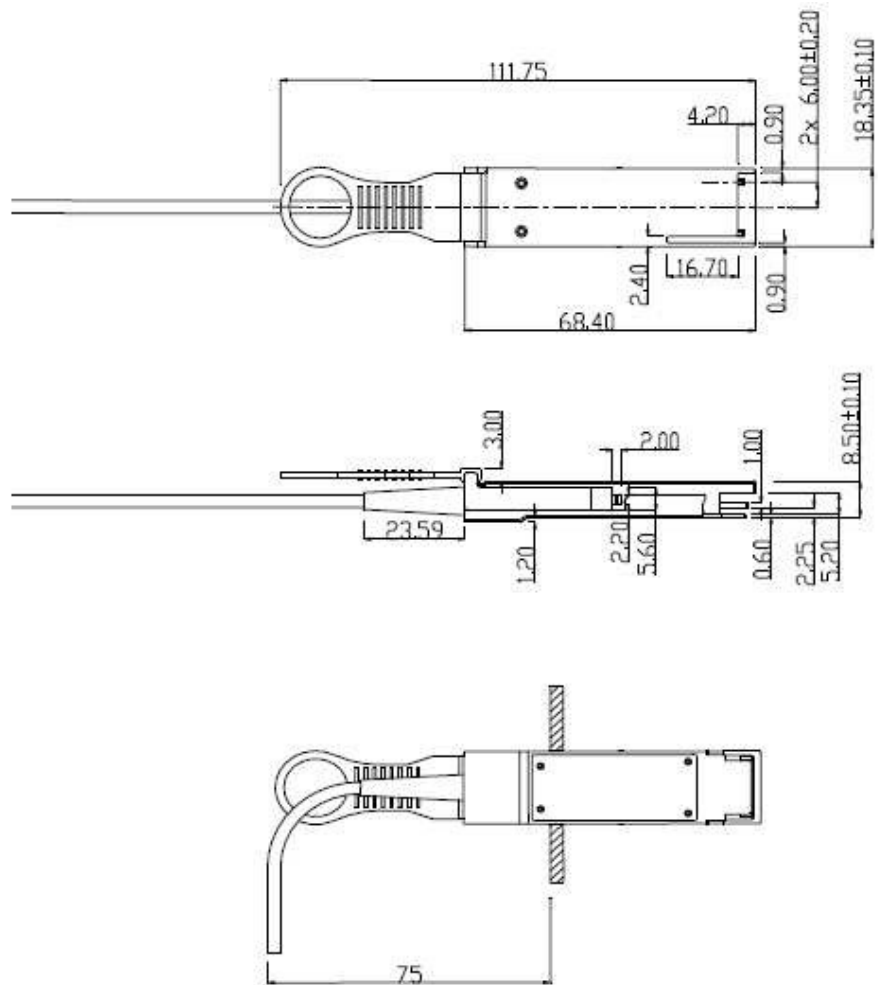


## Recommended Application Interface Circuit



Mechanical Specifications

| Parameter                               | Symbol | Min.       | Typ. | Max.       | Unit   | Notes |
|-----------------------------------------|--------|------------|------|------------|--------|-------|
| AOC Cable Length (L>5m)                 | L      | L-(L*1.1%) | L    | L+(L*1.1%) | M      |       |
| Module Retention                        |        | 90         |      | 170        | N      |       |
| Module Insertion                        |        | 0          |      | 18         | N      |       |
| Module Extraction                       |        | 0          |      | 25         | N      |       |
| Cable Pull Strength – Apply Load at 0°  |        | 44         |      |            | N      |       |
| Cable Pull Strength – Apply Load at 90° |        | 33         |      |            | N      |       |
| Clearance Out of IO Bezel               |        | 75         |      |            | mm     |       |
| Cable Bending Radius                    |        | 3          |      |            | cm     |       |
| Insertion/Removal Cycles                |        | 50         |      |            | Cycles |       |



Clearance 75mm Is Required.  
Cable Type: Low Smoke Zero Halogen